CHAPTER 12: WATER & WASTEWATER

Overview

The purpose of the Water and Wastewater chapter is to provide information on the water and wastewater services in Chesterfield County. The chapter also provides guidance and direction for meeting the county's needs based upon the growth and development anticipated by The Land Use Plan chapter.

Currently, needs for water use and wastewater disposal are met primarily by the public water and wastewater systems. Private individual wells and individual on-site septic systems serve some limited development.

Upon adoption of the Comprehensive Plan, a more detailed analysis of the public utility systems will be performed with an update to the *Water and Wastewater Facilities Plan*. The results will be used for the Comprehensive Plan update in five years. Currently, developers are responsible for bearing the cost of water and wastewater line extensions to serve their development. Developers, however, may receive partial reimbursement for constructing lines as discussed in the "Existing Regulations for Public Water & Wastewater" section. The majority of the county's public systems were built by developers.

Growth will naturally occur where water and wastewater are available and development will often dictate where public water and wastewater services are provided. Proper planning will influence expansion of utility service areas, while limiting other public facilities needed to support development.

Public Water and Wastewater

The Department of Utilities ("Department") operates and maintains extensive water and wastewater systems which include water treatment, storage, transmission and distribution as well as wastewater treatment and collection systems. The county is well positioned to meet current water demands and wastewater flows with sufficient reserve capacity to accommodate the growth anticipated by the Land Use Plan Map.

The following is an overview of the Department's operations:

- Funded solely by connection and user fees and not by the general fund.
- One of only three utilities in the country to have an AAA bond rating from the top three credit rating services.
- Lowest water and wastewater user fees in the Richmond area.
- One of a limited number of governmental water and wastewater agencies that has a budgeting structure to fund replacement of aging infrastructure.
- Owns, operates and maintains water and wastewater treatment plants.
- Member of the Appomattox River Water Authority and the South Central Wastewater Authority.
- Obtains water from three sources– Swift Creek Reservoir, Lake Chesdin and the James River.
- Maintains approximately 1,900 miles of water lines with over 100,000 water accounts.
- Maintains approximately 1,865 miles of wastewater lines with over 85,000 wastewater accounts.
- Agreements with Richmond for water and wastewater services, and Colonial Heights and Petersburg for wastewater conveyance.
- Through an agreement with Powhatan County, provides a maximum of 572,000 gallons of water per day.
- Through an agreement with Gray Land and Development Company, provides a maximum of 188,000 gallons of water per day and 135,000 gallons per day of wastewater service to specific properties in Powhatan.

The operations of the Department's facilities are permitted and regulated by the Virginia Department of Health and the Virginia Department of Environmental Quality. These state agencies along with other local, state and federal agencies mandate how public water and wastewater systems are constructed and operated.

WATER AND WASTEWATER PLAN

The county's current *Water and Wastewater Facilities Plan*, last revised in 1999, addresses county-wide water and wastewater system expansions and upgrades. The *Plan* specifies improvements to increase the quality and reliability of the systems and to meet demands due to growth. For utility planning purposes, the update will assume a land use scenario consistent with that performed for the Transportation chapter and will assume full development of the county ("build-out"). The build-out scenario assumes that the county will ultimately be fully developed ("build-out"). While the Land Use Plan Map does not anticipate build-out during the lifecycle of this Comprehensive Plan, evaluation of a build-out potential is necessary to establish a foundation for an adequate water and wastewater network should future land uses differ from those recommended for the Rural Residential/Agricultural area. The build-out scenario assumes development based upon the recommendations of the Land Use Plan, except for that area designated for Rural Residential/Agricultural. To plan for possible future growth in the Rural Residential/Agricultural area and the resulting impact on the road network, a land use scenario was developed assuming that at some time in the future public facilities to include public wastewater service would be available to support alternative land uses. More detail regarding the build-out scenario can be found in the Transportation chapter.

The *Water and Wastewater Facilities Plan* promotes orderly growth and efficient system expansion by using sound engineering practices to ensure future extensions are an integral part of the Department's overall water and wastewater systems. Once the Comprehensive Plan has been adopted, the Department's consultant will begin updating the *Water and Wastewater Facilities Plan.* This technical document serves as a guide for the 10-year Utility Capital Improvements Program.

WATER

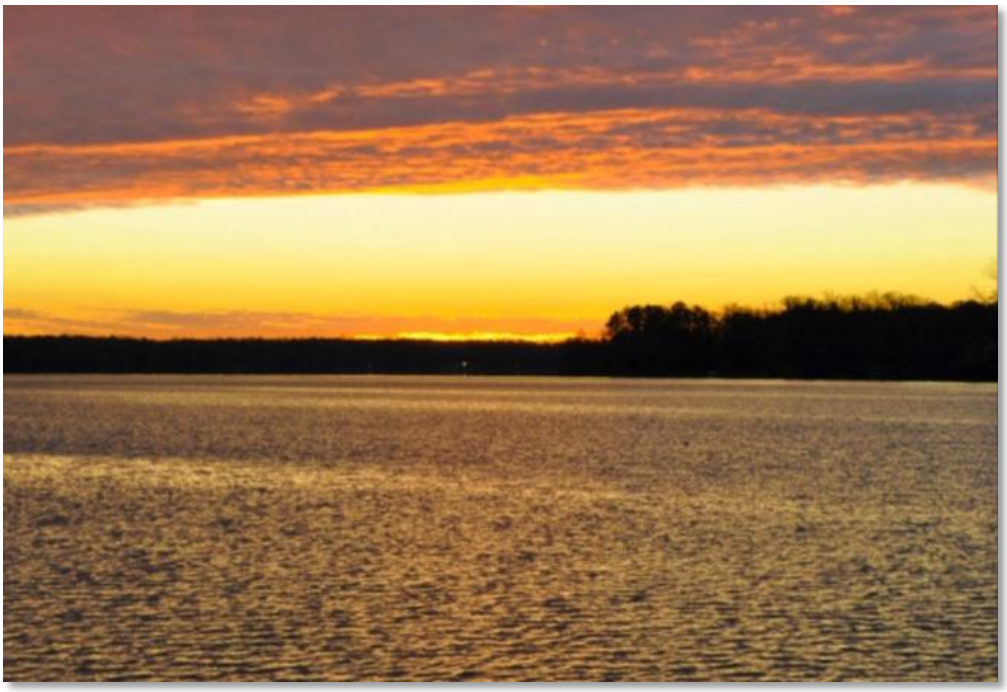
The Swift Creek Reservoir, James River and Lake Chesdin provide an ample water supply to the county's citizens. Treated water from these three sources is interconnected, thereby providing a reliable water distribution system. The county owns 105.5 million gallons per day of water capacity from these three sources and is in negotiations with Richmond to increase capacity to a total of 115.5 million gallons of water per day.

Public Water Sources

Swift Creek Reservoir

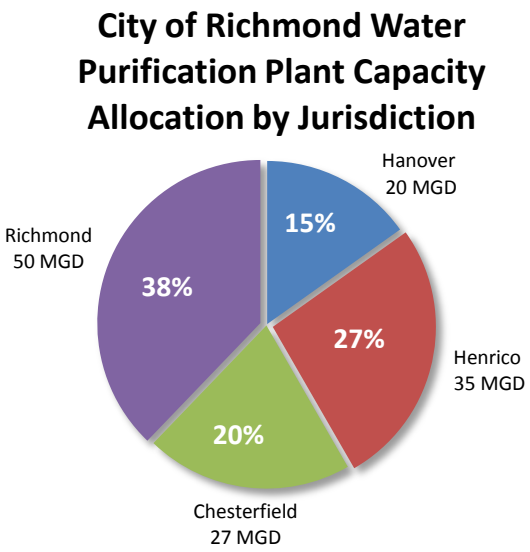
- Reservoir is approximately 1,700 acres.
- County owns water rights, but the land underneath the reservoir is privately owned.
- Watershed is approximately 40,000 acres with 33,000 acres within the county's boundary.
- Water is treated at the Addison-Evans Water Production and Laboratory Facility.
- County owns, operates and maintains the facility.
- Facility has capacity to provide 12 million gallons of water per day.
- Facility capacity cannot be increased.
- Facility is a state certified drinking water laboratory, analyzing approximately 4,000 public water samples each month.

In addition to Chesapeake Bay Regulations, specific water quality measures are in place for that part of the watershed within the county boundary. More detailed information is provided in the Environment chapter.



James River

- County purchases treated water from Richmond.
- Water is treated at the City of Richmond Water Purification Plant.
- Richmond owns, operates and maintains the plant.
- Plant has capacity to provide 132 million gallons of water per day.
- As of 2012, county has rights to 27 million gallons of water per day.

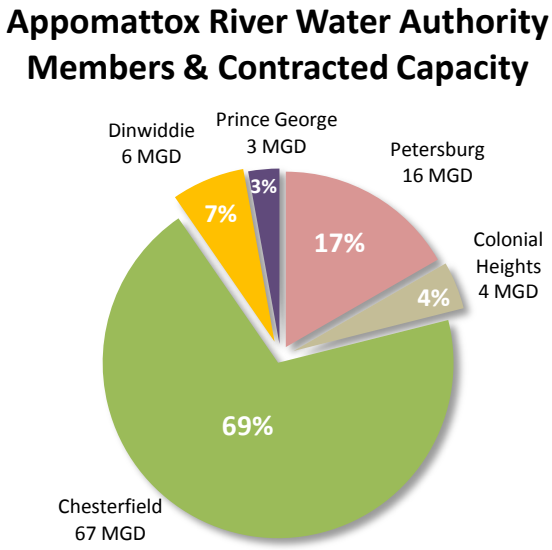


The county is in process of negotiating purchase of an additional 10 million gallons per day. When this capacity is purchased, the county will evaluate shifting water service areas to maximize use of water from this source. This could include expanding the James River service area to incorporate a portion of the Lake Chesdin service area.

Chesapeake Bay Regulations are in place to address water quality measures. More detailed information is provided in the Environment chapter.

Lake Chesdin

- Lake Chesdin is approximately 3,100 acres.
- Watershed is approximately 854,000 acres with 65,500 acres within the county's boundary.
- Water is withdrawn by the Appomattox River Water Authority (ARWA).
- Water is treated at the Appomattox River Water Authority Plant.
- Appomattox River Water Authority operates and maintains the plant.



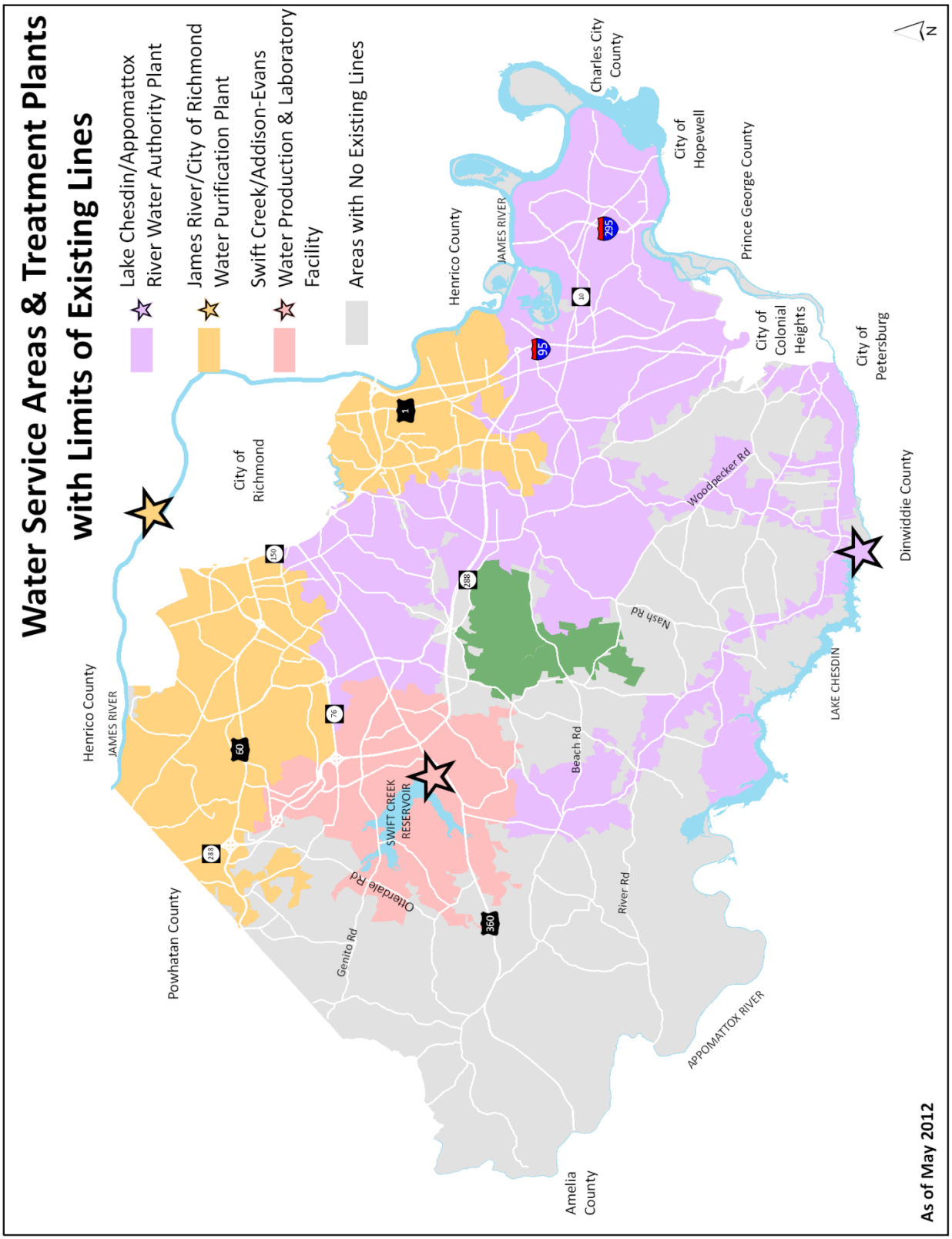
- Plant is owned by members of the Authority (Counties of Chesterfield, Dinwiddie and Prince George; and the Cities of Colonial Heights and Petersburg).
- Plant has a capacity to provide 96 million gallons of water per day.
- County has rights to 66.5 million gallons of water per day.
- Lake Chesdin provides public recreational opportunities, such as fishing and boating.

Chesapeake Bay Regulations are in place to address water quality measures. More detailed information is provided in the Environment chapter.

Over the past five years, the annual average water usage from each source is as follows:

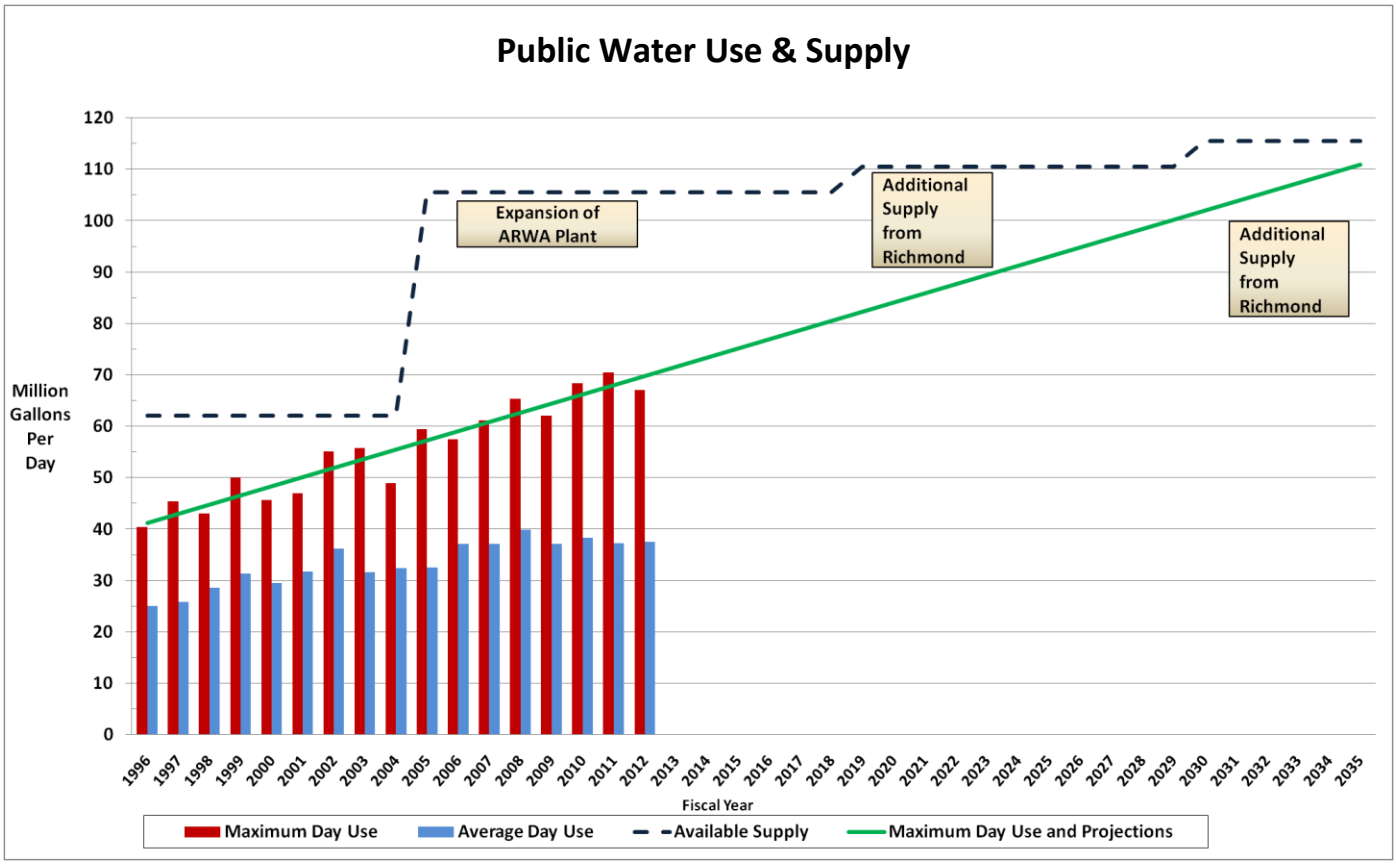
- Swift Creek Reservoir – 21 percent
- James River – 27 percent
- Lake Chesdin – 52 percent.

The map on the following page depicts the general location of the water treatment facilities which serve the county and the current boundary of the areas served by the existing lines from each facility on any given day. As previously noted, the system is interconnected to allow water distribution throughout the county from any of the treatment plants. The map does not show the ultimate limits of the area that can be served by the public water system.


Water Service Areas & Treatment Plants with Limits of Existing Lines
Lake Chesdin/Appomattox River Water Authority Plant
James River/City of Richmond Water Purification Plant
Swift Creek/Addison-Evans Water Production & Laboratory Facility
Areas with No Existing Lines
N
Henrico County
JAMES RIVER
Powhatan County
City of Richmond
Henrico County
JAMES RIVER
Charles City County
City of Hopewell
Prince George County
City of Colonial Heights
City of Petersburg
Dinwiddie County
Woodpecker Rd
Nash Rd
LAKE CHESDIN
SWIFT CREEK RESERVOIR
Otterdale Rd
Beach Rd
River Rd
Genito Rd
APPOMATTOX RIVER
Amelia County
As of May 2012

Planning For Future Water Demands

In Fiscal Year 2011, water demands averaged 37.3 million gallons of water per day. In July 2010, 70.4 million gallons of water was used, a maximum peak day usage. While the average daily water use has increased slightly due to growth, the maximum daily use increase can be attributed to lawn irrigation systems. Water supplies are projected to be adequate until 2047.



Future water needs will be met by increasing source capacity and implementing demand management strategies. Because of the limitation on increasing the water supply from Swift Creek Reservoir and the James River, the county plans for Lake Chesdin to be the source of water to meet future demands.

The drought in 2002 led the state to direct localities to develop a 50 year water supply plan. As a result, the Appomattox River Water Authority retained a consultant to determine if Lake Chesdin could meet future member jurisdictions' water demands. The consultant has completed the draft study, *Regional Water Supply Plan (2007),* which has been submitted to the Virginia Department of Environmental Quality for review with approval anticipated in 2013. Upon approval, the Appomattox River Water Authority will determine the actions necessary to ensure Lake Chesdin can accommodate future water demands for the county and other member jurisdictions.

The *Regional Water Supply Plan* suggests several alternatives for increasing the capacity of Lake Chesdin and also recommends implementation of demand management strategies:

- Construction of another reservoir to capture water from the Appomattox River during wet periods to be released to Lake Chesdin, as needed.
- Increasing the overflow elevation of the George Brasfield Dam on Lake Chesdin.
- Dredging of Lake Chesdin.

The Department of Utilities and Chesterfield County leaders fully understand and appreciate the critical role adequate water supplies are for the county's future. The recent droughts of 2010 and 2012 serve to accentuate the importance of reliable water sources for the health of a community. Staff from both the ARWA and the Department of Utilities continuously works with governmental regulatory agencies, engineering consultants and water supply professionals and others to evaluate and develop all feasible short term and long term solutions for enhancing and expanding drinking water sources that will reliably serve the county's needs in the future.

Demand management strategies promote water conservation resulting in overall efficiency of system operations and reducing the need for capital investments. Reduction in peak demands lowers total capacity requirements and the cost of providing services. Implementation of strategies by individual utility customers and the county will extend the capacity of the county's water supply. The degree of customer participation will determine when additional water sources are needed.

Customers can implement efficient irrigation practices and install:

- Drought resistant landscaping
- Soil moisture and rain sensors on irrigation systems
- Micro and drip irrigation systems
- Rain barrels
- Efficient irrigation systems.

Chesterfield County can:

- Provide education on efficient irrigation practices, drought resistant landscaping and use of rain barrels.
- Institute tiered-rate structure to provide incentives for reducing usage.

Water Reclamation and Reuse

Water reclamation and reuse will play a significant role in the county's future. Wastewater from the county's treatment plants can be treated for reuse and used to reduce the demands on the existing water supply. Wastewater can be reclaimed for uses such as industrial processes. The United States Environmental Protection Agency's guidelines address the level of treatment required to use reclaimed wastewater. The level of treatment depends upon the end use of the water. The Virginia State Water Control Board has developed *Water Reclamation and Reuse* regulations which are administered by the Virginia Department of Environmental Quality.

The immediate benefit of water reuse projects are:

- Less treated wastewater discharge to the James River.
- Reduction in operational costs for the county and users of reclaimed wastewater.

The county has one of the largest water reuse projects in the state through an agreement with Dominion Virginia Power to supply reclaimed water from the Proctors Creek Plant for use in air scrubbers at the Dutch Gap Power Plant. This is an example of potential future opportunities for use of reclaimed water. Future opportunities for reclaimed water reuse such as limited irrigation will be explored in the updated *Water and Wastewater Facilities Plan.*

WASTEWATER

County wastewater is treated at four plants: Falling Creek, Proctor's Creek, Richmond and South Central Wastewater Authority. The general service area for these plants is based upon topography. Chesterfield County and Richmond have reciprocal agreements for wastewater service to areas that naturally drain to each other's jurisdiction. The total treatment capacity, exclusive of the Richmond plant, is 39.4 million gallons per day.

Public Wastewater Treatment Facilities

Falling Creek

- County owns, operates and maintains the plant.
- Plant capacity is 10.1 million gallons per day.
- Plant capacity expansion may be impractical due to physical land constraints.
- Some wastewater from Richmond is treated at this plant.

Proctors Creek

- County owns, operates and maintains the facility.
- Facility capacity is 27 million gallons per day.
- Facility treatment capacity will be expanded to 54 million gallons per day by 2026.
- Facility provides laboratory services for county treatment plants and tests related to the Industrial Wastewater Pre-Treatment Program.

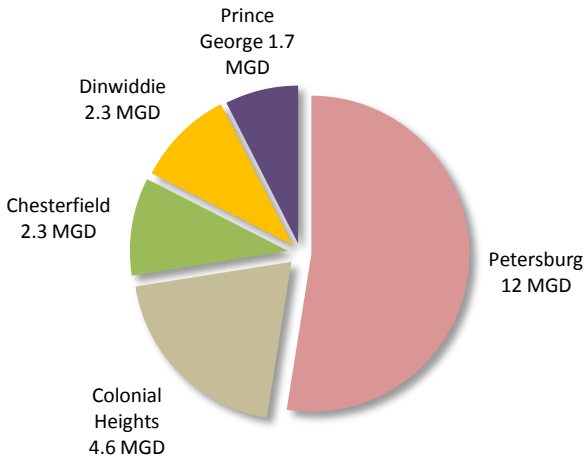
Richmond

- City owns, operates and maintains the plant.
- Plant capacity is 70 million gallons per day.
- Some of county's wastewater is treated at this plant.

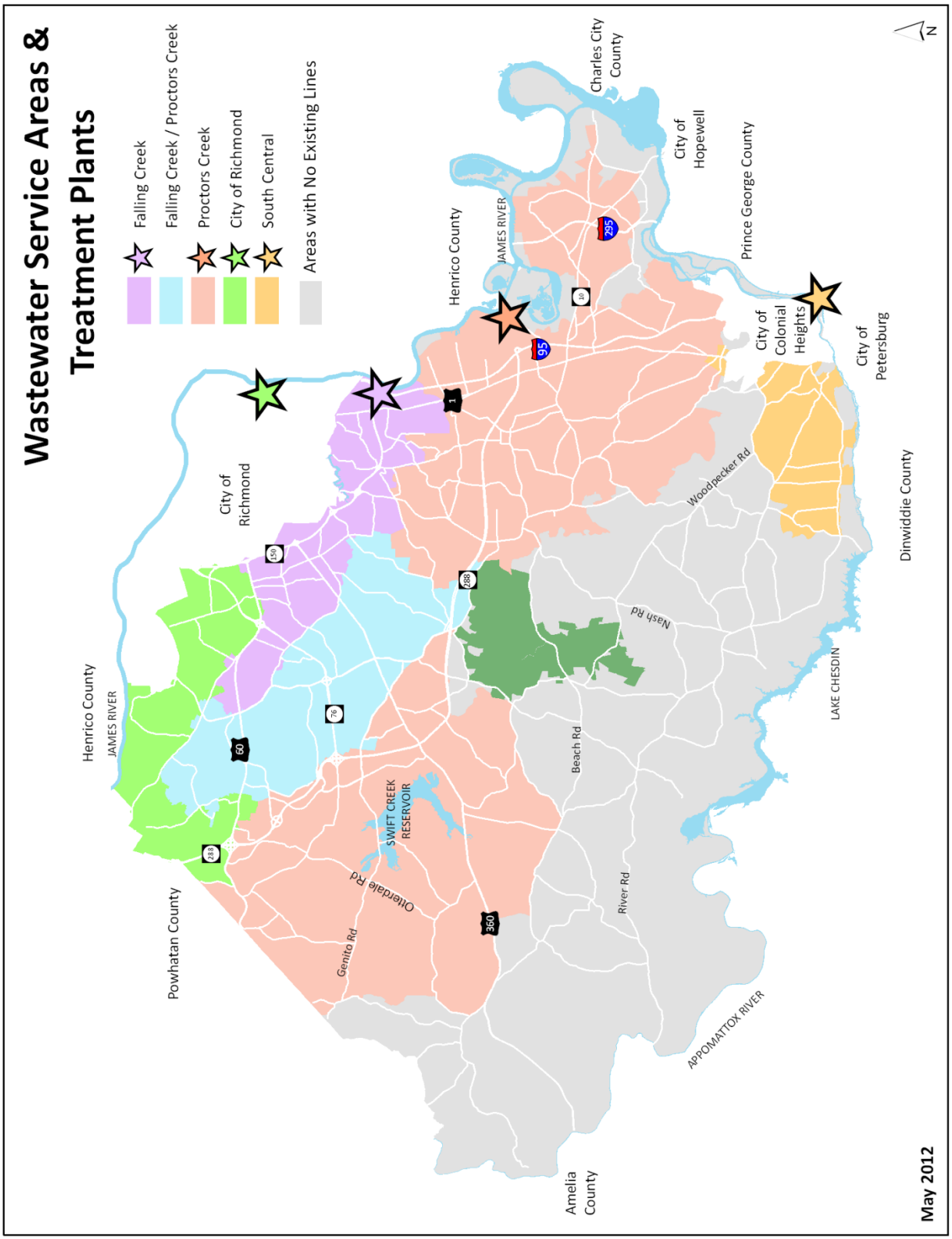
South Central Wastewater Authority

- South Central Wastewater Authority operates and maintains the plant.
- Plant is owned by members of the Authority.
- Plant capacity is 23 million gallons per day.
- County has rights to 2.3 million gallons per day of plant's capacity.
- Plant could be expanded to 32 million gallons per day.

South Central Wastewater Authority Members & Contracted Capacity



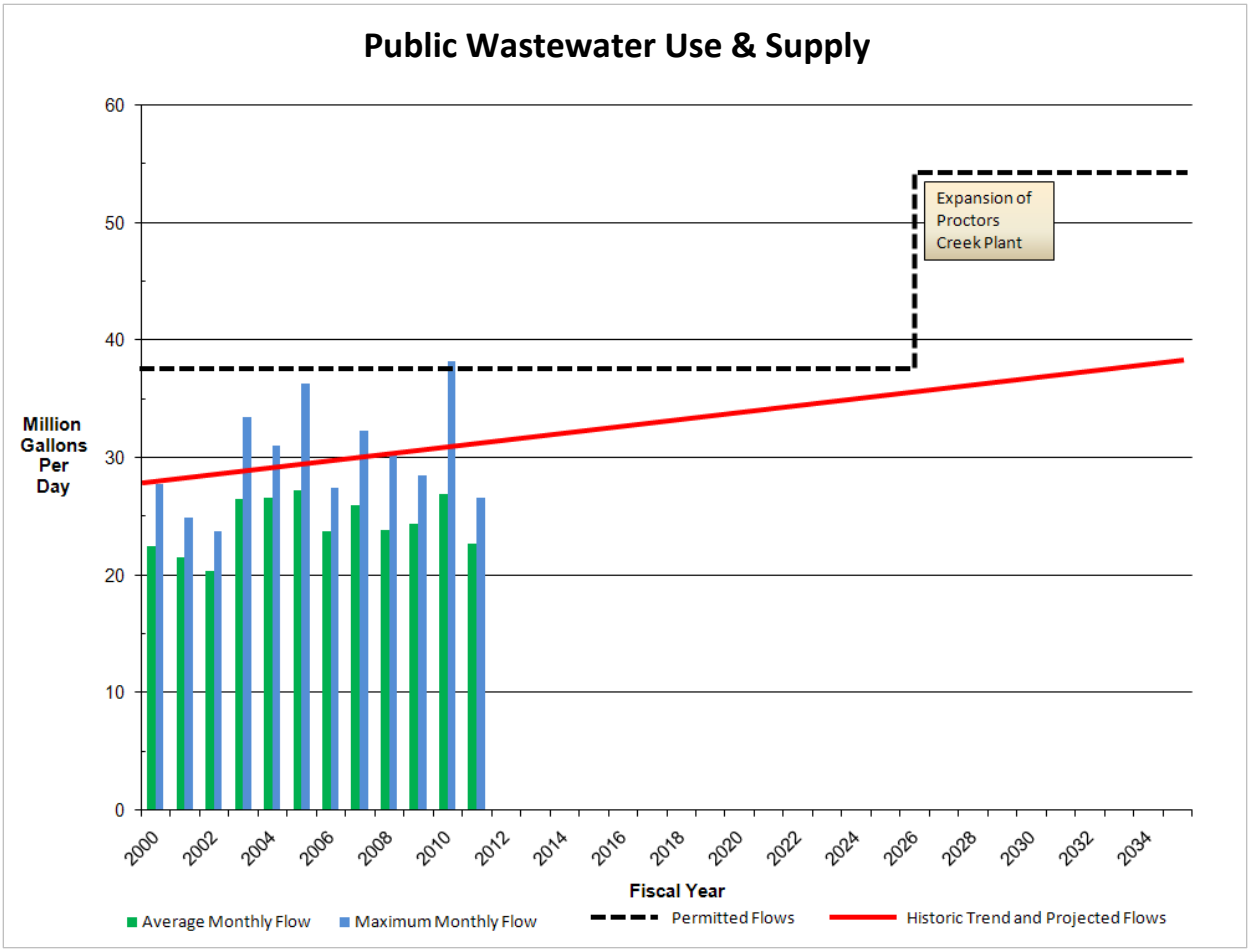
The map on the following page depicts the general location of the wastewater treatment facilities which serve the county and the current boundary of the areas served by the existing lines to each facility. To address capacity limitations at the Falling Creek Treatment Plant, flows from the northern Falling Creek area can be directed to, and treated at, either the Falling Creek Treatment Plant or the Proctor's Creek Treatment Plant.


Wastewater Service Areas & Treatment Plants
Falling Creek
Falling Creek / Proctors Creek
Proctors Creek
City of Richmond
South Central
Areas with No Existing Lines
N
Charles City County
City of Hopewell
Prince George County
Henrico County
JAMES RIVER
City of Colonial Heights
City of Petersburg
City of Richmond
Dinwiddie County
Woodpecker Rd
Nash Rd
LAKE CHESDIN
Henrico County
JAMES RIVER
Beach Rd
SWIFT CREEK RESERVOIR
Otterdale Rd
Genito Rd
River Rd
Powhatan County
APPOMATTOX RIVER
Amelia County
May 2012

Planning For Future Wastewater Service

The wastewater agreement with Richmond does not specify the amount of county wastewater that will be accepted into their system. The county plans an expansion of the Proctors Creek Plant increasing the total capacity of wastewater treatment, exclusive of the Richmond plant, to 66.4 million gallons per day.

The Virginia Department of Environmental Quality regulates the amount of nutrients, primarily nitrogen and phosphorus, which can be discharged to surface waters from wastewater treatment plants. Each locality has a nutrient allocation that may be discharged which impacts the amount of wastewater that can be treated. The county's permit allows the Proctor's Creek Facility and Falling Creek Plant a total nitrogen waste load of 564,952 pounds per year and a total phosphorus waste load of 56,495 pounds per year. While the county plans to increase the total hydraulic capacity to 66.4 million gallons per day, the total waste load allocations will remain the same. Both treatment plants are being upgraded to meet nutrient removal standards. Based upon these allocations, total capacity of the two facilities is 66.4 million gallons per day. With this capability, wastewater treatment should be adequate well into the future. Details related to the *Federal Clean Water Act*, the Virginia Pollution Discharge Elimination System and the Virginia Water Pollution Permit process can be found in the Environment chapter.



Existing Regulations for Public Water & Wastewater

MANDATORY CONNECTIONS

Connections to the public systems are generally required for development under the following circumstances:

- Parcels which are less than 1 acre
- Parcels where the existing water or wastewater line is less than 200 feet from the property line.

The ***Code of Virginia*** allows the Board of Supervisors to grant exceptions to these mandatory requirements under certain circumstances such as topography or conflicts with underground utilities.

Connection to the public water system is also required in the vicinity of Carver Heights Drive and Bradley Bridge Road.

In addition, there are other areas of the county where properties which are zoned for new subdivision residential use are required to connect to the systems regardless of the parcel size or the distance of the parcel from the exiting lines. These mandatory connection areas were adopted with previous Comprehensive Plan amendments and were designed to address orderly growth and development patterns. The ***Code*** provides for exemptions to these mandatory connections under certain circumstances.

UTILITY EXTENSIONS

Utility extensions must be in the best interest of the utility system with respect to effective design and the health, safety and welfare of citizens. The private sector is responsible for extending, and bearing the cost of, public water and wastewater infrastructure necessary to serve their developments. When in the interest of the overall system, the Department may require a developer to install larger lines than those required for the specific development. In return, the developer is eligible for refunds from the Department derived from connection fees generated by the development. The developer may also receive refunds in a similar manner for off-site utilities installations.

SPECIAL DISTRICTS

The ***Code*** allows the Board of Supervisors to establish special districts for public water and wastewater extensions and services. These districts include:

- Assessment districts to fund extension of the public systems into developed areas experiencing issues with private on-site wells or septic system or to undeveloped or partly developed areas. The county funds the extensions with the property owners repaying the county through a supplemental real estate tax.
- Development districts to promote economic development in areas where it is not practical for individual property owners to pay for the cost of extensions. The county funds the extension through the capital improvements program with property owners repaying the county when the property is developed. Given that the county's investment is for an indefinite period of time, the county has not recently created one of these districts.

Private Water and Wastewater

INDIVIDUAL ON-SITE WELLS

Private wells are regulated by the Chesterfield Health District and discussed in the Environment chapter.

INDIVIDUAL ON-SITE WASTEWATER SYSTEMS

Private on-site wastewater systems are regulated by the Chesterfield Health District and discussed in the Environment chapter.

PRIVATELY OWNED/OPERATED COMMUNITY WATER AND WASTEWATER TREATMENT FACILITIES

The evolution of the county's water and wastewater treatment facilities reflects an efficient trend away from dispersed smaller facilities to fewer, larger facilities serving large areas. The county does not support the use of water and wastewater facilities serving multiple users which are owned and operated by private entities. The potential risks associated with operational failures resulting in environmental consequences, rate inequities and business failures are significant and could result in undue financial remedies at public expense. It is critical that the county continue to maintain the public centralized treatment approach to ensure orderly growth and development, protect public health, protect the environment and ensure fiscal accountability to citizens.

General Water and Wastewater Guidelines

The General Water and Wastewater Guidelines provide direction for the orderly extension of the public systems when addressing specific development proposals, preserving the water supply and protecting the environment.

Major considerations in the development of these guidelines include:

- ❖ Acknowledging the guidelines of The Land Use Plan chapter relative to the use of public systems.
- ❖ Acknowledging existing regulations regarding protection of water quality and the impact of those regulations on wastewater treatment.
- ❖ Supporting the guidelines of the Environment chapter relative to the protection of water quality.
- ❖ Continuing operational practices that contribute to the Department of Utilities' financial stability and an AAA bond rating from the top three credit rating services.

The following General Water and Wastewater Guidelines should be used when considering water and wastewater decisions:

- **Public Water and Wastewater Line Extensions.**
  - Support development that is consistent with The Land Use Plan chapter with respect to use of the public water and wastewater systems.
  - Discourage development that is inconsistent with The Land Use Plan chapter relative to use of the public water and wastewater systems and could place a strain on the public utilities systems.
  - Consider the impacts of developments proposing to extend water and wastewater systems through undeveloped areas potentially spurring growth and development inconsistent with the recommendations of The Land Use Plan chapter.
  - Evaluate the current Assessment District Ordinance and consider other methods of funding the extension of public water and wastewater to serve existing aging residential areas developed on private individual wells and wastewater systems.

- **Mandatory Public Water and Wastewater Connections.** Consider revising codes relative to mandatory connection requirements in accordance with the recommendations of The Land Use Plan chapter.

- **Financial Stability.** Consider the impacts of decisions on the financial stability of the public water and wastewater systems.

- **Economic Development and Revitalization.** Seek sources of funding to address utility infrastructure needs for Economic Development Opportunity Sites, Enterprise Zones and Targeted Revitalization Areas, identified in the Economic Development and Revitalization chapters.

- **Private Sector Financing of Public Utilities.** Continue to require the private sector to bear the cost of public water and wastewater infrastructure to serve new developments.

- **Water Quality.** Support efforts to continue to protect the quality of the county's drinking water sources, as outlined in the Environment chapter.

- **Regional Cooperation.** Encourage continued regional cooperation in providing public water and wastewater infrastructure and acquiring additional capacity necessary to meet future growth and development needs.

- **Water Supply.** Evaluate measures recommended by the *Regional Water Supply Plan* to ensure adequate water supply and implement, as appropriate.

- **Water Reuse.** Promote opportunities for industries in the vicinity of the wastewater treatment plants to partner with the county to use treated reclaimed water.

- **Reduction in Water Demands.** Provide incentives to reduce irrigation usage.

- **Education.** Consider enhancement and expansion of community, school and library outreach programs to educate the public on water conservation practices such as use of irrigation, rain barrels and drought tolerant landscaping.